

REMARKS/ARGUMENTS

Claim 1 is amended, and claims 21-23 are newly added. Claims 13-15 were previously canceled. Claims 1-12 and 16-23 are now pending in the application. Applicant respectfully requests reexamination and reconsideration of the application.

Claims 1-11, 13-16, and 18-20 were rejected under 35 USC § 103(a) as obvious in view of US Patent No. 6,150,186 to Chen et al. ("Chen") and US Patent No. 4,983,804 to Chan et al. ("Chan"). In addition, claim 12 was rejected under 35 USC § 103(a) as obvious in view Chen, Chan, and US Patent No. 5,340,537 to Barrett ("Barrett"), and claim 17 was rejected under 35 USC § 103(a) as obvious in view Chen, Chan, and US Patent No. 5,476,211 to Khandros ("Khandros"). Applicants respectfully traverse these rejections on the grounds that there is insufficient motivation to combine Chen and Chan and on the further grounds that, even if Chen and Chan were to be combined, the combination does not meet all of the requirements the claims.

Independent claim 1 is directed to a "method for heat treating a plurality of conductive interconnect structures attached to a substrate." An oscillating electromagnetic field heats "the interconnect structures *without substantially heating the substrate*" to which the interconnect structures are attached. The Office Action acknowledges that "Chen et al. is silent regarding how the contact is subjected to heat treatment." (Office Action of Jan. 14, 2005, pg. 3.) It follows that Chen does not teach "heating the interconnect structures *without substantially heating the substrate*," as required by claim 1.

Chan—which discloses a system for melting selected solder joints on an electronics module without melting other solder joints—was cited in the Office Action to make up for this deficiency in Chen. The stated motivation for combining Chan with Chen is to "heat [treat] the interconnection structure of Chen . . . without heating or damaging the substrate [to which the interconnection structures are attached] or other structures on the substrate." (Advisory Action of March 31, 2005, paragraph 11.) The only teaching or suggestion to avoid heating the substrate, however, is in Applicant's specification. Neither Chen nor Chan include any teaching that would motivate a person skilled in the field to heat Chen's wire contact 208 without also heating the base 202 to which the wire contact 208 is attached.

Chen does not provide even a hint of any disadvantage arising from heating base 202, nor does Chen teach that heat treating wire contact 208 in any way damages base 202. Indeed, no

reason to avoid heating base 202 while heat treating spring contact 208 is found anywhere in Chen.

Chan similarly lacks any teaching or even a hint of any advantage to be gained by not heating a substrate. Chan's only concern is not heating other solder on PCB 11 (e.g., the solder holding ICs 18 and 28 in Figure 1). (Chan col. 2, line 40-46.) Chan is not concerned with avoiding heating either of the two substrates disclosed in Chan: the flex circuit 12 and the PCB 11. Indeed, in one embodiment, Chan places the magnetic heating plate 19 directly on the flex circuit 12, which will substantially heat flex circuit 12. (Chan col. 2, lines 52-58.) In another embodiment, Chan embeds the magnetic heating plate 19 within the PCB 11, which also will substantially heat the PCB 11. (Chan col. 2, lines 58-61.)

Thus, neither Chen nor Chan teaches, suggests, or provides any motivation to modify Chen to heat only wire contacts 208 without also heating base 202. For this reason alone, the combination of Chen and Chan is improper and the rejection should be withdrawn.

Moreover, a person of skill in the art would not think that Chan's system for melting solder could be used to heat treat Chen's wire contacts 208. Chen's solder-melting mechanism is neither powerful nor precisely controlled. Indeed, the amount of heat Chan's mechanism generates varies widely (e.g., 200-400°C) and is generated for only a very short period of time (e.g., less than 20 seconds). (See Chan col. 2, line 64 through col. 3, line 1.) All that is accomplished by Chan's heating mechanism is temporary melting of an easily melted compound. Heat treating Chen's wire contacts 208, on the other hand, requires precise temperature control and the delivery of heat for an extended period of time. (See, e.g., Chen col. 1, lines 44-47; col. 6, lines 23-25; and col. 11, lines 39-61.) Moreover, in contrast to the mere melting of solder, Chen's heat treatment effects a transformation of the internal structure and mechanical properties of the contact structures. (Chen col. 1, lines 44-58; and col. 10, lines 34-36.) No person of skill in the field would be motivated to use Chan's simply solder-melting apparatus with Chen's complex heat treating process. In fact, a person would be no more motivated to heat treat Chen's wire contacts 208 using Chan's solder-melting apparatus than to heat treat Chen's wire contacts 202 by holding a soldering iron against the wire contacts 202. For this further reason, the combination of Chen and Chan is improper and the rejection should be withdrawn.

The rejection of claim 1 should also be withdrawn on the further grounds that, even if Chan's solder-melting apparatus were combined with Chen as proposed in the Office Action, the

combination would not teach all of the requirements of claim 1. Claim 1 includes "maintaining the contactor in the oscillating electromagnetic field until each of the interconnect structures obtains a defined heat-treatment temperature substantially greater than an ambient temperature for a predetermined period of time sufficient to permanently improve a mechanical operating property of the interconnect structure." Chan's solder-melting apparatus is not designed to and, indeed is not able to, provide or maintain heat sufficient "to permanently improve a mechanical operating property of the interconnect structure," as required by claim 1. As discussed above, Chan's solder-melting system provides a very imprecise temperature (e.g., varying as widely as 200-400°C) for only a very short period of time (e.g., less than 20 seconds). (See Chan col. 2, line 64 through col. 3, line 1.) The solder is temporarily melted but then quickly returns to its original sold state; no permanent change—much less improvement—to the mechanical operating properties of the solder occurs. Thus, even if combined, Chen and Chan fail to disclose all of the requirements of claim 1 because Chan's solder-melting apparatus cannot provide or maintain heat sufficient "to permanently improve a mechanical operating property of the interconnect structure."

For this additional reason, claim 1 is patentable over Chen and Chan and the rejection should be withdrawn.

Claims 2-12 and 16-22 depend from claim 1 and are therefore patentable for the same reasons as claim 1. (The other prior art of record does not make up for the above-described deficiencies in Chen and Chan.) In addition, claims 2-12 and 16-20 recite other features not found in the prior art of record. For example, claim 12 describes the use of a heat-indicating paint on the interconnect structures of claim 1. Barrett is relied on for its general teachings regarding the existence of such heat-indicating paints. Again, however, there is no motivation to combine Barrett with Chen and Chan. In fact, Chan teaches away from the need for any temperature indicating device because, according to the Chan disclosure, Chan's heating device is self regulating and will heat the pads and substrate only to a predetermined temperature. (Chan col. 3, lines 37-31.) Because Chan's heating device is self regulating and heats to a known temperature, there would be no reason to use temperature indicating paints like those disclosed in Barrett.

New claim 23 includes a step of "moving at least one of the oscillating electromagnetic field or said contactor to scan said conductive interconnect structures with said oscillating

electromagnetic field and thereby permanently improve a mechanical operating property of the interconnect structures." None of the prior art of record teaches or suggests such a step. Claim 23 is therefore patentable over the prior art of record.

In view of the foregoing, Applicant submits that all objections and rejections are overcome and all of the pending claims are allowable and the application is in condition for allowance. If the Examiner believes that a discussion with Applicant's attorney would be helpful, the Examiner is invited to contact the undersigned at (801) 323-5934.

Respectfully submitted,

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